

## ORNITHOLOGICAL LITERATURE

BREEDING BIOLOGY OF THE EGYPTIAN PLOVER *Pluvianus aegyptius*. By Thomas R. Howell. Univ. Calif. Publ. Zool. Vol. 113, Univ. California Press, Berkeley, California, 1979:76 pp., color frontispiece, 15 black-and-white plates, 6 numbered text figs., 5 tables. \$10.50.—The Egyptian Plover, which is not a plover and no longer occurs in Egypt, has been an ornithological enigma fraught with the uncertainties attendant to a largely anecdotal and embellished literature. This courser (Cursoriinae, Glareolidae) figures in the textbooks as the reputed symbiont that gleans food particles from between the teeth of crocodiles (*Crocodilus niloticus*) and as a species whose buried eggs are incubated by solar heat. To our good fortune, a keen student of "avian adaptations that contribute to reproductive success in difficult and unusual environments" has conducted the first detailed field investigation of the species. The work was carried out on the Baro River at Gambela, Ethiopia from 24 January-6 April 1977, and this publication is the fascinating product of these efforts.

The principal subject of the research is evident from the title; the plover-crocodile association was only of minor concern. Nonetheless, Howell provides a brief but informative historical review of the latter, commencing with Herodotus who visited Egypt in 459 BC and "wrote of a bird called the Trochilos" which foraged inside "the gaping mouths of basking crocodiles." Although Howell never observed this behavior, he concludes from the published evidence that it probably occurs, and that it "may have been more frequent and widespread in earlier times, when both crocodiles and Egyptian Plovers were common all along the Nile." The interesting point is made that Herodotus' Trochilos cannot be identified with certainty as the Egyptian Plover; it may have been one of the spur-winged plovers (*Hoplopterus* sp.) or some other species.

Any sense of disappointment that the question of plover-crocodile symbiosis was not resolved once and for all is overwhelmed by the wealth of information on breeding biology contained in the remainder of the publication. Moreover, Howell's presentation is so logically structured and devoid of prolixity that a thoroughly lucid exposition of a large amount of data is packed within a relatively short monograph. Much of the data concern the remarkable egg-burying behavior of the Egyptian Plover which is central to a number of ecophysiological and behavioral adaptations of the species. The salient points are described below.

The eggs (usual clutch is 2 or 3) are laid in a scrape and kept covered with sand (to a depth of 2-3 mm above their upper surfaces) during the day. Adults toss the sand over the eggs with their beaks. Howell quantified the thermoregulatory parameters of nesting behavior by simultaneously recording nest temperatures (using thermocouple-implanted eggs) and relevant ambient temperatures. The pattern which emerged demonstrated that incubation is a "balanced combination of body heat, solar heat, and heat retained by the sand." During the periods from sunrise to about 10:00 and from about 16:00 to sunset, the latter two heat sources incubate the eggs, allowing the adults time to rest and feed. During the hottest part of the day (approximately 10:00 to 16:00) the eggs are in imminent danger of being overheated and solar input must be moderated. Simple shading of the nest is inadequate; instead the adults make frequent trips to the nearby river where they soak their ventral feathers, then quickly return and settle on the nest thereby moistening the eggs and surrounding sand. The resultant evaporative cooling keeps the eggs below lethal temperatures. Somehow the adults monitor nest temperatures (possibly with the beak), and their behavior varies accordingly. On cloudy days, for example, they stop wetting the eggs and regulation of nest temperatures is through other behaviors, such as varying the depth of the sand cover and/or settling on the nest. With the chill of night, an adult scrapes the sand (using its feet) away from the eggs and incubates them with the direct application of body heat. After hatching, the egg-

burying and nest-wetting behaviors carry over to the chicks. The latter are highly precocial and respond to potential danger by flattening themselves on the ground whereupon the adults cover them with sand. The chick-burying habit appears to be unique among birds, and is often so thorough that an observer cannot find them. While buried, the young are frequently wetted by the adults. This has significance in meeting the thermal stresses of early life, especially during the hottest hours of the day. The foregoing behaviors are nicely illustrated by accompanying plates.

Since Egyptian Plover eggs are small (9.5 g) relative to body weight (78 g) and incubation is protracted (30 days), Howell devotes a considerable portion of the monograph to the physiology of incubation. He hypothesizes that a lengthy period of incubation is "adaptively advantageous" since it produces a highly precocial chick able to survive in a difficult environment, and that the nest-wetting habit allows the small egg to withstand extended incubation without excessive dehydration.

The text is replete with a well-reasoned evolutionary theme concerning the adaptive values of the Egyptian Plover's breeding habits. Howell also uses his findings in an interesting "attempt to reconstruct the phylogeny" of the species. This outstanding monograph merits the attention of most avian biologists.—OSCAR W. JOHNSON.

THE PEREGRINE FALCON. By Derek Ratcliffe. Illus. by Donald Watson. Buteo Books, P.O. Box 481, Vermillion, South Dakota 57069, 416 pp., 4 color plates, 60 black-and-white photographs, numerous drawings, 16 numbered text figs., 23 tables. \$42.50.—This is a detailed account of the biology of the British Peregrine Falcon (*Falco peregrinus*), surely the most thoroughly studied population of this species in the world. Major chapters are devoted to distribution, abundance, food, breeding behavior, population regulation and dynamics, and to man-caused impacts endured by the bird in historical times. The author claims the book has "no pretensions of scientific sophistication." Nevertheless, the vast data are exhaustively presented in table form and are tightly reviewed.

Ratcliffe has gone far beyond his own experience with the peregrine and provides a perspective based on both the formal and casual observations of hundreds of people. The book is probably the best single way yet to find out what peregrines are all about.

This book leaves the reader with two major impressions. One is the thoroughness with which the author and his many co-workers have recorded field data on over 950 eyries in England, Scotland and Wales. The other is the remarkable resiliency shown by peregrines in habitat so populated by people with varied interests in the bird. Falconry, first practiced by the Saxons in the 9th Century, flourished into the 1800's. Peregrine territories apparently remained at an upper numerical limit despite protection by nobility in that period. Between 1770 and the Second World War gamekeepers destroyed large numbers of peregrines, mainly on behalf of the Red Grouse (*Lagopus lagopus*). In one small locality alone in Scotland, 98 peregrines were killed between 1837 and 1840. Egg collectors, first active about 1840, took several hundred clutches in England such that few young fledged in some districts between 1900 and 1960. Between 1925 and 1959 racing pigeon fanciers waged war on peregrines. As before, immigration from more remote areas prevailed and territory occupancy was little affected. From 1939–1945 the Air Ministry organized destruction of nests to protect carrier pigeons, resulting in a brief 13% decline of the national peregrine population. Pesticides created a more severe reduction. Compounds such as dieldrin apparently increased adult mortality, and coupled with DDE-related egg breakage, evoked a population crash to 44% of pre-war numbers in the period 1955–1964. Following a ban on dieldrin and greatly reduced use of DDT, the population had increased to 75% of the pre-war level by 1979. The author